CLAIMS

Claim 1. In a Wavelet transform process for compressing digital data representative of an object, a method for accelerating the encoding of bits, comprising the steps of:

performing a Wavelet transform on said digital data thus forming hierarchical tree data, each node of each tree in said tree data containing Wavelet transform coefficients and associated parameters, each tree having a root node v, the bits for every said tree being contained in bit_planes;

as said Wavelet transform coefficients are obtained, counting for each said bit-plane the bits of: said node $\mathbf{v}$; $B_1(\mathbf{v})$ bits representing the magnitude of the Wavelet transform coefficients associated with all descendents of a said node $\mathbf{v}$; and $B_2(\mathbf{v})$ bits representing the magnitude of the Wavelet transform coefficients associated with all grandchildren and their descendents of said node $\mathbf{v}$;

accumulating said bit-counts during computing of said Wavelet transform;

emitting all bits produced by said node as soon as said node is processed; and

stopping the production of unneeded bits upon reaching a stopping criterion

Claim 2. The method of claim 1, wherein said stopping step further comprises setting a bit-budget allocated among said bit-

planes, said budget fixing the maximum number of bits allowed to be emitted from said coefficients at each said node during processing.

Claim 3. The method of claim 1, comprising the further steps of:

maintaining a bit-counter for each said bit-plane;

summing the total number of bits produced in each said bit-plane to determine within a fixed bit_budget the exact number of bits emitted in the last plane examined; and

stopping said bit summing at said point.

Claim 4. The method of claim 2, wherein the number of bits emitted by a said node in a given said bit-plane includes a value bit for bit-planes b such that $B_1(\boldsymbol{p}) \geq b$ where $\boldsymbol{p}$ is a parent node.

Claim 5. The method of claim 4, wherein the number of bits emitted by a said node in a given said bit-plane includes a signum bit for bit-planes b of $b = B(\boldsymbol{v})$.

Claim 6. The method of claim 5, wherein the number of bits emitted by a said node in a given said bit-plane includes emitting a B_1 bit for $B_2(\boldsymbol{p}) \geq b \geq B_1(\boldsymbol{v})$.

Claim 7. The method of claim 6, wherein the number of bits emitted by a said node in a given said bit-plane includes emitting a B_2 bit for $B_1(\boldsymbol{v}) \geq b \geq B_2(\boldsymbol{v})$.

Claim 8. The method of claim 7, further comprising the step of maintaining separate output queues in accordance with predetermined criteria.

Claim 9. The method of claim 1, comprising the further step of designating subtrees in said tree corresponding to sub-parts of said object.

Claim 10. The method of claim 7, further comprising the steps of:

providing a plurality of accumulators corresponding to the number of said bit-planes being processed, sequenced from the most significant to the least significant bit-plane; and

incrementing each said accumulator as each said Wavelet coefficient is stored by the number of bits that said coefficient will contribute to the corresponding said bit-plane.

Claim 11. The method of claim 1, comprising the further step of extracting only bits from higher planes for the remaining trees after said bit-budget is reached for a given tree.

Claim 12. The method of claim 7, comprising the further steps of:

instructing said nodes to emit bits from said bit-planes up to and including an ending bit-plane, until a predetermined said bit-budget allocated to said ending bit-plane is reached; and

forming said bits emitted from said ending bit-plane in three queues, the first said queue receiving bits comprising the node bits for $b > B(v)$; the second said queue receiving $b = B(v)$ bits, said

signum bits, and said B_1 and B_2 bits; and the third said queue receiving remaining node value bits.

Claim 13. The method of claim 1, wherein said emitting step comprises the further steps of:

instructing an active node to describe its own coefficients and emit bits subject to a bit-dtopping criterion;

determining whether any node below said active node is large enough to continue traversal based on a node selection criterion and a stopping criterion; and

returning to said traversal algorithm if said determination is negative.

Claim 14. The method of claim 13, comprising the further step of:

activating, as determined by a tree traversal criterion and a node selection criterion, all children of said active node when said determination is affirmative; and

subject to a bit emission stopping criterion, instructing said children nodes to describe their coefficients and to emit all relevant bits in turn.

Claim 15. The method of claim 14, comprising the further step of computing concurrently the bits of plural ones of selected said nodes.

Claim 16. The method of claim 15, wherein said process further comprises the step of receiving and decoding said encoding bits.

Claim 17. The method of claim 16, comprising the further step of changing the order of traversal between encoding and decoding of said bits.

Claim 18. In a Wavelet transform process for compressing digital data representative of an object, the improvement comprising:

performing a sub-band decomposition of said digital data into hierarchical tree data of Wavelet transform coefficients;

traversing the subtrees associated with each tree node *v*;

in the course of said traversing,

determining the highest bit-plane in which any direct descendant of said node *v* has a non-zero bit and the highest bit-plane in which any indirect descendant of node *v* has a non-zero bit; and

determining the highest the bit-plane *B(v)* in which the coefficient *v* of said node *v* has a non-zero bit;

and

within a fixed bit-budget allocated among said bit-planes, emitting the bits generated into an output queue.